Enclosure

Comments on Pre-Remedial Basis of Design Technical Evaluations Work Plan Gasco Sediments Cleanup Action Dated July 13, 2017

Comments dated October 17, 2017

The following are the U.S. Environmental Protection Agency's (EPA's) comments on the *Pre-Remedial Basis of Design Technical Evaluations Work Plan* (Work Plan), dated July 13, 2017 prepared by Anchor QEA, LLC on behalf of NW Natural. The Work Plan has been prepared under the Administrative Settlement Agreement and Order on Consent (AOC); Docket No. CERCLA 10-2009-0255. Once approved, a data gaps sampling and analysis plan will be prepared for the collection of data necessary to complete the technical evaluations described in the Work Plan, implement the sampling and analysis, and perform the EPA-approved technical evaluations following receipt of the validated data.

General Work Plan Comments:

1. EPA considers the Work Plan to be a framework document for establishing the sediment remedy planning and design process. Consequently, it is premature to fully solidify specific engineering calculations and models; data collection, use, and analysis methodologies; and/or remedy monitoring, performance, and effectiveness criteria in the submittal. This comment set includes comments on these types of technical details for the respondent's information going forward for the purposes of next steps, such as filling data gaps. However, specific technical details in the Work Plan will be subject to re-evaluation and modification during the design process, and inclusion in future Sediment Remedy Basis of Design Technical Evaluation Memoranda for review and approval by EPA.

2. The Work Plan provides a framework for identifying the Final Project Area through refinement of the Draft Engineering Evaluation/Cost Analysis (EE/CA) Interim Project Area. The Interim Project Area was identified in May 2012 within the Draft EE/CA and used information such as remedial action levels (RALs) identified in the draft Portland Harbor Feasibility Study (FS). However, the Final Project Area for remedial design is defined as the sediment management area (SMA) located on the west side of the Willamette River as shown on the Portland Harbor Superfund Site Record of Decision (ROD) Figures 31b. and 31c. (which are attached to these comments) extending from river mile (RM) 5 to the Railroad Bridge located at approximately RM 6.9. This SMA will be further delineated by remedial design sampling remedial action levels (RALs) for focused contaminants of concerns (COCs) and principal threat waste (PTW) thresholds identified on Table 21 of the ROD are exceeded.

3. The Work Plan is not clear on how (or if) the Table 17 ROD cleanup levels will be integrated into the remedy design process. The Work Plan appears to consider the remedy performance standards to be the RALs. For clarification, performance standards are not limited to the

RALs and the work plan should identify where in design Table 17 ROD cleanup levels will be evaluated for, and applied to proposed remedial design methodologies.

4. EPA is currently developing "points of compliance" (POCs) for the Portland Harbor, and intends to apply consistent POCs harbor-wide. Consequently, the performance standards established for the Gasco Sediments Site must align with the POCs EPA establishes for monitoring and assessing remedy performance throughout the harbor. EPA intends to finalize POCs early in the Gasco SMA remedy design process, at which time applicable Sediment Remedy Basis of Design Technical Evaluation Memoranda should be identified for incorporation of POCs.

5. To ensure a comprehensive and protective remedy for the Gasco Sediments Site, the in-water sediment remedy planning and design process must be integrated with the final upland remedy(s) selected from the uplands FS process under authority of the Oregon Department of Environmental Quality (DEQ).

Section 2 – RAOs, ARARs, and Cleanup Levels

6. **Section 2.1 Remedial Action Objectives, pages 3-4:** This section reiterates the nine ROD remedial action objectives (RAOs). EPA notes that RAO 4, RAO 8, and RAO 9 will require close coordination with the uplands remedy planning and design process. EPA recommends that the status of uplands work integral to designing the sediment remedy be identified as part of the pre-design work. For example, the Data Gaps Sampling and Analysis to be prepared should include identification of uplands data gaps requiring resolution for in-water design purposes.

7. **Section 2.2 Applicable or Relevant and Appropriate Requirements and To Be Considered, page 4:** The second and third paragraphs specifically uses the terminology "applicable or relevant" with respect to determining whether regulatory citations will be considered for the Site. The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the National Contingency Plan (NCP) define ARARs as either "applicable" or "relevant and appropriate" requirements (ARARs). The ROD identified the ARARs for the remedy and should not be reinterpreted. EPA assumes all ARARs are pertinent to the cleanup at the Gasco SMA unless specific information is provided that shows one or more identified ARARs are not applicable or relevant and appropriate to the Gasco SMA remedial design and remedial action and EPA agrees.

8. **Section 2.2 Applicable or Relevant and Appropriate Requirements and To Be Considered, page 4:** The second paragraph states that some of the ARARs described in Work Plan Table 1 may not be applicable to the Gasco Sediments Site. It is unclear why ARARs are excluded because there was no justification provided. See the above comment on Section 2.2. Table 1 should be revised to include all ARARs identified in the ROD unless a justification is provided in the text and, with any supporting information, why one or more ARARs are not applicable or relevant and appropriate requirements for the Gasco SMA and EPA agrees.

9. **Section 2.2 Applicable or Relevant and Appropriate Requirements and To Be Considered, page 4:** The methods for demonstrating substantive compliance should be included for all ARARs applicable to the Gasco Sediments Site. The specific methods of

documenting the substantive compliance with each ARAR must be discussed. For example, will technical memoranda be developed or other type document be submitted to document SMA-specific Clean Water Act (CWA) Section 404 and Endangered Species Act (ESA) analysis, or water quality monitoring approaches, etc. Will forms be used for some activities or will electronic documentation (spreadsheets, etc.) be used? Additional examples of missing information, includes but is not limited to, the Work Plan does not describe how fugitive emissions will be assessed or monitored or that a performance evaluation will be completed for the remedial design to meet the substantive compliance with Oregon Air Pollution Control, Resource Conservation Recovery Act (RCRA) and Oregon's Hazardous Waste requirements for on-site handling and storage.

Section 4 – Pre-Remedial Design Technical Evaluations

10. **Section 4, Pre-Remedial Design Technical Evaluations:** This section proposes pre-design methodologies for conducting technical evaluations and presents a preliminary list of the evaluations. "*Uplands and Sediment Remedy Sequencing and Integration*" should be added to the list to acknowledge that integration of uplands and in-water remedies warrants technical evaluation during the sediment remedy planning and design process. This request is consistent with Section 2.2 of the September 2009 AOC/statement of work (SOW) that requires remediation work to: "…1) extend from the river sediments up to the top of the bank slope ending where the generally level portions of the site begin; 2) result in a continuous fully integrated slope from the top of the riverbank to permanently submerged sediments; and 3) be constructed at one time with one set of river water quality protection measures consistent with both riverbank and sediment designs." This request is further supported by the Selected Remedy approach described in Section 14.2.9.5 of the ROD to remediate contaminated river banks where it is determined that such action should be conducted in conjunction with the in-river actions and to protect the remedy (also see ROD Figure 9 and Tables 17 and 21).

11. **Section 4.1 Gasco Sediments Site Use Evaluation:** It is unclear how the site use evaluation will be used in the remedial design. The navigational channel and Future Maintenance Dredge (FMD) areas are considered in technology application evaluations (i.e. dredging evaluation). Additionally, the use of structures, including the docks and outfall systems, identified in Section 4.1, are captured in Section 4.7. The text should identify any other technical evaluations identified in Section 4 that would consider additional site uses and clarify how this information will be used in remedial design.

12. **Section 4.1, Gasco Sediments Site Use Evaluation:** EPA's January 24, 2014 letter referenced in the comment to "Section 3.6, Project Area Characterization, page 10-11" below should be considered for information relevant to the evaluations of the Gasco Fuel Pipeline Dock and Siltronic Outfalls discussed in this section.

13. **Section 4.2, Capping Demonstration Evaluation:** Text should be added to this Work Plan section stating the objective of the capping demonstration evaluation.

14. **Section 4.2, Capping Demonstration Evaluation:** The ROD states, "caps will also factor in appropriate earthquake design elements for contingency level events" (ROD p. 113). However, no consideration of earthquakes or their impacts is given in this Work Plan.

Considering that the Portland Hills Fault is in the immediate vicinity of the site, and the Cascadia subduction zone is at risk for a major earthquake, EPA expects that any design will include relevant earthquake design elements, as stipulated in Section 14.2.9 of the ROD.

15. **Section 4.2, Capping Demonstration Evaluation:** In addition to stability and bearing capacity evaluations, consideration should also be given to consolidation and settlement of sediments under cap loading as estimation of consolidation/settlement of capped areas is important for evaluating long term verification of cap thickness and integrity. Consolidation assessments are also important to assess the rate of time dependent strength gain in soft sediments which may influence staged placement of cap materials on soft sediments.

16. **Section 4.4, Riverbank Remedy Evaluation:** The entire river bank from the top of the bank to the river should be evaluated for the presence of contaminants listed in Table 17 of the ROD that exceed the cleanup levels (CULs) for river bank soil/sediment. The results should be compared to the cleanup levels in Table 17 of the ROD to identify locations of contaminated river bank. Per Section 14.2.5 of the ROD, the PTW thresholds and RALs in Table 21 of the ROD should be used to identify contaminated river bank areas that require remediation to protect the Selected Remedy. River bank areas having PTW and/or erosive soil with concentrations exceeding RALs will require remediation per the technology application decision tree in Figure 28 of the ROD. The interpretation that the PTW thresholds and RALs only apply to riverbank below the ordinary high-water level is inconsistent with Section 6.6.6 of the ROD which states, "river banks are defined from the top of the bank down to the river." See also the comment to "Section 4.4.4 Presence of PTW-NAPL/NRC and RAL and PRG Exceedances Evaluations (Riverbank Remedy Evaluation), Page 43, 1st complete paragraph" below.

17. **Section 4.4, Riverbank Remedy Evaluation:** The technical approach for river bank erosion evaluation described in Section 4.4.2 is missing an analysis of river bank erosion due to gravitational forces and the erosion effects of overland stormwater runoff, which may be significant factors in the riverbank erosion pathway to the river at this site. The Work Plan states that a river bank erosion evaluation will be performed consistent with the cap erosion evaluations presented in Section 4.2.5; however, these evaluations appear to be limited to evaluation of cap erosion due to river currents, wind and boat-generated waves, and prop wash. The technical approach in the Work Plan should be modified to include gravitational forces, groundwater seepage, and overland stormwater runoff. The evaluation of erosion due to gravitational forces should include an assessment of the bank height, slope, soil type, structures, and presence of armoring and vegetation.

18. **Section 4.4, Riverbank Remedy Evaluation:** Although EPA agrees that the lateral continuity of PTW-Non-Aqueous Phase Liquid (NAPL)/Not Reliably Contained (NRC) between top of river bank and bottom of slope borings is a good line of evidence of presence of PTW-NAPL/NRC in the river bank, it is EPA's position that the presence of PTW-NAPL/NRC in a single top of bank boring will require additional investigation to delineate the lateral and vertical extent of PTW-NAPL/NRC in the river bank. The reason for this requirement is that the extent of PTW-NAPL/NRC in the river bank is not known and even though it may not be detected in the bottom of bank boring, the presence of PTW-NAPL/NRC in and below the river bank represents a future risk of contamination to the river.

19. **Section 4.5, Dredge Sediment Waste Handling and Transport Evaluation:** The evaluations and analyses discussed in 4.5 should consider ROD Section 14.2.12 (Use of Green Remediation Practices). A Green Remediation Plan will be required during remedial design consistent with the outline provided in Appendix M of the Portland Harbor Feasibility Study[1]. The plan should include an evaluation of transport and handling of waste to identify green practices to reduce impacts to the health of the community adjacent to where work is occurring, including an evaluation of diesel emissions from hauling equipment.

20. **Section 4.5 Dredge Sediment Waste Handling and Transport Evaluation, page 44-46:** A materials management plan (MMP) should be identified in the Work Plan and incorporated into the remedial design for the Final Project Area. The MMP should include:

    a. Means and methods, including recordkeeping, to demonstrate compliance with substantive requirements of ARARs identified in Table 1 for waste handling work conducted within the Portland Harbor Superfund Site

    b. Means and methods, including recordkeeping, to demonstrate compliance with substantive and administrative requirements of applicable Federal, state and local laws and regulations for work conducted offsite, including transload, transport, and waste disposal outside of the Portland Harbor Superfund Site

    c. Organizational structure of waste management activities

    d. Dredge sediment characterization and classification approach for offsite transport and disposal, including determination of whether the dredged sediment contains RCRA listed or characteristic hazardous waste, Toxic Substance Control Act (TSCA) waste, and/or State of Oregon listed hazardous waste. Discussion of the means and methods for classification including procedures for requesting any required approvals from DEQ, such as "contained in" determinations, should be presented. The approach proposed shall demonstrate compliance with substantive and administrative requirements of applicable Federal, state and local laws and regulations for transport and waste disposal outside of the Portland Harbor Superfund Site. Pertinent information developed as part of Waste Disposal Classification Evaluation as described in Section 4.6 (and as modified by comments provided herein) shall be included.

    e. Other activities associated with handling, transport, and disposal of waste, which have been described in the Work Plan and not specifically identified in this comment.

21. **Section 4.5 Dredge Sediment Waste Handling and Transport Evaluation, page 44 to 46:** Lessons learned from the Gasco 2005 non-time critical removal action (NTCRA) should be included in the analysis of waste handling for dredged sediments. For example, the NTCRA oversight report[2] described that future removal actions should consider the importance of properly characterizing areas where loading and off-loading activities will

[1] Portland Harbor Feasibility Study, Prepared by U.S. Environmental Protection Agency and CDM Smith, June 2016

[2] GASCO Early Removal Action Construction Oversight Report, prepared by Parametrix for the U.S. Environmental Protection Agency Region 10, November 16, 2006

occur to support the evaluation of contaminants that are tracked off-site or spilled. This lesson learned should be considered during the evaluations to support the remedial design. Additionally, the oversight report includes lessons learned for dredging, engineering controls, best management practices, monitoring, community outreach, and a discussion of data gaps that should be included in the evaluations for the remedial design.

The waste handling evaluation should include lessons learned for industrial storm water management at transloading facilities at Terminal 4 (T4) and lessons learned from other removal actions performed by the Portland Harbor Superfund Site should be incorporated into the evaluations for remedial design. For example, the T4 Phase 1 removal action at the Port of Portland included a contingency plan for rain events at the Dalles transloading facility even though construction occurred during the dry summer months. There was considerable rain during transloading that was addressed by the contingency plan, which had anticipated an approach to mitigate these conditions[3].

22. **Section 4.5.2 Dewatering Amendment Addition, page 44-45:** This subsection needs to also discuss the ability of amendments to comply with ARARs related to waste disposal requirements as well as facility waste acceptance requirements and applicable Federal, State, and local regulations and requirements offsite in addition to those related to free liquids (e.g. leachability of wastes, etc.), or explain why that is not necessary to meet ARARs and ROD requirements for PTW.

23. **Section 4.5.4 Data Requirements and Data Gaps, page 44:** The discussion needs to explain why sampling and analysis of wastes would not need to be conducted to determine the appropriate type of dewatering amendment, as well as treatment amendment necessary to comply with ARARs related to waste disposal requirements as well as facility waste acceptance requirements and applicable Federal, State, and local regulations and requirements offsite, or explain why that is not necessary to meet ARARs and ROD requirements for PTW.

24. **Section 4.6 Waste Disposal Classification Evaluation, page 46-50:** A MMP should be identified in the Work Plan and incorporated into the remedial design for the Final Project Area including the elements described in the comment to "Section 4.5 Dredge Sediment Waste Handling and Transport Evaluation, page 44-46" above.

25. **Section 4.6.2 Material Disposal Testing Evaluations, pages 47-49:** Waste disposal testing and classifications should be reviewed and revised to reflect changes made to federal and state regulations, policy, and guidance since the AOC/SOW was finalized and that are pertinent to the project. The material disposal evaluation for wastes classified as Cleanup Materials should include landfill worker safety, equipment decontamination, recording keeping, and other requirements for disposing of Cleanup Materials with halogenated solvents and/or manufactured gas plant-related constituents at a Subtitle D facility.

[3] Final Removal Action Completion Report Terminal 4 Phase 1 Removal Action Port of Portland, Portland, Oregon. Prepared by Anchor QEA, LLC for the Port of Portland, June 2009.

26. **Section 4.6.2 Material Disposal Testing Evaluations, pages 47-49:** The discussion implies that F-listed hazardous waste is identified based on contaminant concentrations. However, per RCRA, F-listed hazardous waste is identified based on the wastes originating from non-specific sources. The process of identifying F-listed wastes needs to be revised to conform with the substantive requirements of RCRA as indicated at 40 Code of Federal Regulations (CFR) 262.11(a through c).

27. **Section 4.6.3 Dredge Material Testing Framework, page 49:** The discussion implies that toxic contaminant leaching protocol (TCLP) sampling will be the primary differentiator for determination of material classifications. However, this process does not address all ARAR-related considerations for waste classification. For instance, extremely high pH (which could occur from excessive quicklime treatment) could result in characteristic hazardous waste. Another example is F-listed waste, which stays listed regardless of TCLP concentrations except under specific circumstances. The testing framework should be reviewed and revised to account for all waste characterization requirements under ARARs and disposal facility waste acceptance requirements and applicable Federal, State, and local regulations and requirements offsite. Dredge sediment characterization and classification should include determination of whether the dredged sediment contains RCRA listed or characteristic hazardous waste, TSCA waste, and/or State of Oregon listed hazardous waste. Discussion of the means and methods for classification including procedures for requesting any required approvals from DEQ, such as "contained in" determinations, should be included.

28. **Section 4.6.4. Basis of Design and Technical Memorandum Elements, page 50, 1st bullet:** The technical memorandum for disposing of project wastes includes identifying disposal sites for each waste classification (i.e., Hazardous Waste, Special Waste, and Cleanup Materials). Consistent with the AOC/SOW, the Work Plan indicates that Cleanup Materials may be transported to, and disposed of at a Subtitle D landfill holding a permit issued by the State that allows the facility to accept such material. The AOC/SOW also states that, "EPA and Respondents acknowledge that, to protect groundwater, OAR 340-093-0170(3)(d) requires an Oregon solid waste landfill receiving Cleanup Materials contaminated by hazardous substances to develop a "special waste management plan" (not to be confused with the project-specific Special Waste category, [SWMP]) that, with DEQ approval, allows the landfill to accept such material. Due to the scale of the project and the potential quantities of contaminated dredged sediments, DEQ may require that the SWMP of the Subtitle D receiving facility (or facilities) be updated or amended to reflect project-specific information. Modifications to a facility's SWMP are subject to DEQ review and approval.

29. **Section 4.7. Functional Structures Determination:** EPA agrees that the evaluation of structures should merge the considerations for structures presented on page 115 of the ROD and the decision process presented in Appendix I, Figure 28, Technology Application Decision Tree of the ROD. However, the method of analysis and terms presented in the Functional Structures Determination section are confusing. The following bullets summarize the two supporting pieces of information presented in the ROD:

    - Figure 28 of the ROD presents the decision process for determining the appropriate remedial technology for contaminated sediment near structures. The functionality of the structure must first be established prior to determining whether the structure is

permanent (floating or movable). If the structure is both functional and permanent (not floating or movable), then the remedial technology assigned to the contaminated sediment near the structure is "Cap", not "Dredge and Cap").

- Page 115 of the ROD presents structural considerations for dredging design after the remedial technology ("Dredge and Cap") has been assigned. This supporting information uses similar terminology as presented in Figure 28 of the ROD, "permanent (e.g., not floating or movable), functional (e.g. not beyond its design life and/or in disrepair), or needed for current or future property and waterway use." However, the Work Plan text does not present the decision process for determining the technology assignment.

Recommended revisions, in accordance with this general comment, are presented in the specific comments to Section 4.7 below.

30. **Section 4.8, Water Quality Best Management Practices Evaluation:** The compilation and evaluation of existing empirical data on water quality operational and barrier control performance and implementability issues should include the document produced for the NTCRA conducted at Gasco in 2005[4].

31. **Section 4.9, Habitat Modification Evaluation:** EPA has the following general comments on Section 4.9:

    a. Coordination should be initiated with the National Marine Fisheries Service (NMFS) as soon as possible to avoid making assumptions about habitat types and values to be used in the Habitat Equivalency Analysis (HEA). For instance, the habitat values in Appendix B are outdated. Please coordinate with NMFS for the current habitat values and other assumptions for the HEA.

    b. A subsequent document should clarify the time intervals for which the HEA will be used to calculate compensation for loss of ecological services, specifically, 1) how will the time interval for the construction disturbance be calculated and 2) how will the time interval from construction to a fully functioning habitat be calculated.

    c. The relevant project life for remedial actions is in perpetuity, not 50 years. A value of 100 years may be used to represent perpetuity, as losses after this time are minimal due to the application of a discount factor. Although all habitat sub-categories that achieve full recovery do so within 50 years, several sub-categories are not expected to recover, so using a longer project life is important to accurately represent losses. Using a longer project life is also important to accurately represent losses in instances when one habitat sub-category is permanently converted to another.

    d. It should be noted that the use of Discounted service-acre years (DSAYs) has been approved by NMFS for compliance with ESA requirements for mitigation of effects on listed species, but may not necessarily account for impacts on other CWA Section 404

[4] GASCO Early Removal Action Construction Oversight Report, prepared by Parametrix for the U.S. Environmental Protection Agency Region 10, November 16, 2006

functions and values. EPA assumes this issue will be addressed in the CWA 404(b)(1) analysis during the design phase.

e. More detail on the proposed habitat data collection activities mentioned in Section 4.9.4 should be provided in a supplemental remedial design work plan. The methods by which characterization and/or quantification of shoreline vegetation and other "habitat conditions" should be described.

f. Similar to item d. above, the use of HEA and DSAYs to mitigate for ESA listed species does not necessarily consider other species such as Pacific lamprey, which are important Tribal resources. Please explain how these resources will be considered.

g. Clarify if the HEA is to be applied to the entire Final Project Area or selected sample areas. If sampling will occur, clarify how the sample areas will be selected.

h. A supplemental remedial design work plan should describe the implementation of reasonable and prudent measures consistent with the NMFS 2005 Biological Opinion (BiOp) for the NW Natural Removal Action at the Gasco Site and the 2006 Final Gasco Oversight Report, which provided additional direction on the BiOp measures. This description should also be part of the Biological Assessment to be prepared for the proposed remedial action.

Specific Work Plan Comments:

Section 3 – Identification of Final Project Area

32. **Section 3, Identification of Final Project Area, page 6, 3rd paragraph:** The Work Plan states, "significant benthic toxicity data have been collected within the Interim Project Area and are summarized in the Draft EE/CA (Anchor QEA 2012a)". The following statement at the end of this paragraph suggests that benthic toxicity data alone may be used to "help evaluate long-term performance of the completed Gasco Sediments remedy." While this may not be the intent of the author, EPA must clarify that no single line of evidence will be used to evaluate long-term performance and that these pre-construction benthic toxicity data must be used in conjunction with sediment chemistry and other technical data to help evaluate long-term performance of the completed Gasco Sediments Site remedy.

33. **Section 3, Identification of Final Project Area, page 6, 2nd paragraph:** The 3rd line of evidence for Final Project Area identification should be revised to acknowledge the role of the riverbank in remedy design planning. It should read, "Additional considerations for the upriver, downriver, channel-ward, and uplands extents."

34. **Section 3.1 Presence of Principal Threat Waste, page 7, PTW-Highly Toxic bullet:** The PTW area at station C300-2 should not be excluded from the Final Project area. While it is recognized PCBs have not been detected at the Gasco site, this area is contiguous to the area being remediated as part of the Gasco action, which includes Siltronic Corporation under the 2009 AOC. Accordingly, this area should be included in design phase investigation data gap analysis that may necessitate additional core samples to evaluate if the SMA footprint encompasses chemicals of concern above RALs in addition to exceedances of PCB PTW which is based on a single core sample.

35. **Section 3.1, Presence of Principal Threat Waste, page 7, PTW-NRC bullet**: The Work Plan indicates the lateral extent of PTW-NRC will be assessed using a design-level cap model that includes "…measured groundwater seepage fluxes during operation of the hydraulic control and containment (HC&C) system in the Gasco property uplands and porewater concentrations." The HC&C system is an interim removal action under DEQ authority that remains subject to effectiveness evaluations in the uplands FS. Consequently, it has not to date been identified as an element of the final remedy. Furthermore, long-term operational, performance, and effectiveness criteria for the uplands and/or riverbank have not been established. Based on this information, the cap model should also simulate the extent of PTW-NRC without the HC&C system operating to provide a basis for comparison and for project planning purposes.

36. **Section 3.1, Presence of Principal Threat Waste, page 7, last paragraph:** The last sentence of this section which reads "As discussed in Section 3.4, the three forms of PTW are not used for evaluation of the Final Project Area in the riverbank." This topic does not appear to be discussed in Section 3.4. For clarification, the riverbank is within the Interim Project Area (see comment to "Section 3.4 Riverbank, page 9" below). The three forms of PTW (PTW-NAPL, PTW-Highly Toxic, PTW-NRC) should be factors in determining the boundaries of the Final Project Area inclusive of the riverbank. Section 4.4. acknowledges that the nature and extent of riverbank PTW-NAPL is a factor in this regard. In addition to PTW identified in the ROD, Oregon state hot spots of contamination associated with the riverbank should be included in the evaluation to ensure the state's interests are considered. The boundaries of PTW and hot spots on and below the riverbank should be compared to support project planning.

37. **Section 3.2, Portland Harbor ROD Remedial Action Levels, page 7:** The Work Plan states that the RALs identified in the ROD, "…will be directly applied at the Gasco Sediments Site." For clarification, although delineation of sediment management areas will be based on the RAL COCs as specified in the ROD, site-specific cleanup levels have not been established. The design criteria and performance standards for the Gasco Sediment Site will be based on achieving the cleanup levels established in Table 17 of the ROD rather than achieving an average sediment concentration below the RALs (as proposed in "Section 4.2.3.2 Chemical Isolation, page 19, bullet 1" of the Work Plan). Furthermore, concentrations of site-specific COCs associated with the Gasco Sediments Site may influence remedy planning. Based on this information, data gaps sampling and analysis should not be limited to RAL COCs. Sampling and analysis should include upland and in-water site-related COCs.

38. **Section 3.3, Refinement of SMAs Based on Additional Data Collection, pages 8-9:** The review of the core-density information available in the EE/CA should consider the density (i.e., availability) of depth-discrete data at core locations. The Work Plan should discuss the results of core density in terms of ROD requirements including the ability to achieve lateral delineation of applicable RAL and PTW thresholds and to achieve vertical delineation of RAL and PTW thresholds to the depth feasible for dredging or to characterize the material to be capped, where applicable.

39. **Section 3.4 Riverbank, page 9:** The definition of the Final Project Area as presented in this section is unclear with respect to riverbank areas. EPA believes this section should be

referring only to the ROD requirements for the riverbank as the overarching document to determine the need for riverbank work since the site SOW pre-dates the ROD. Notably, the ROD states "remediation of contaminated river banks is included in the Selected Remedy where it is determined that it should be conducted in conjunction with the in-river actions *and to protect the remedy*" (emphasis added; ROD p. 117). Thus, because the riverbanks at both Gasco and Siltronic were clearly identified and characterized in the ROD as having "contaminants detected in river bank material at levels *that pose a risk to human health, the environment, or for recontamination to any implemented remedy*," the Work Plan should include the entire riverbank in the Final Project Area (emphasis added see ROD p. 24-25; also see ROD Figure 9). Accordingly, EPA requests clarification regarding how the riverbank evaluation will factor into defining the Final Project Area. The above comment to "Section 3.1, Presence of Principal Threat Waste, page 7, last paragraph" applies here.

40. **Section 3.5, Additional Considerations for Final Project Area Extents, page 9:** Four bulleted "additional secondary lines of evidence" for the upriver, downriver, and channel-ward extents of the Final Project Area are proposed in this section. EPA's comments to this proposed addition are:

    a. General comment on the list of bulleted "additional secondary lines of evidence." An explanation is needed why these secondary lines of evidence are important and how these considerations factor into the decision-making process for the Final Project Area are determined during the design phase. This could be presented through a series of scenarios using these secondary lines of evidence. Absent this detail, EPA cannot understand the context for these "additional considerations" in the overall design scheme nor approve them in this Work Plan.

    b. 2nd bullet. The above comment to "Section 3.2, Portland Harbor ROD Remedial Action Levels, page 7" applies here.

    c. 4th bullet. EPA disagrees that the ROD considers property ownership and boundaries for establishing the final boundary of a project area, including the Gasco Sediment Site project area.

41. **Section 3.6, Project Area Characterization, page 10-11:** This section provides a list of general site characteristics within the Final Project Area that are proposed for use as the basis for the Basis of Design Technical Evaluation Memoranda. EPA's recommends review of its January 24, 2014 letter, titled "Response to Proposed Methods for the Substantial Product Accessibility Analysis, Gasco Sediments Site" which evaluates many of the structures referenced in Sections 3.6.2 and 3.6.3 in the context of sediment remedy planning, including developing a preliminary decision-making hierarchy based on the use and status of structures. EPA notes that the presence of outfall structures should not necessarily preclude dredging in areas adjacent to the existing outfalls. The feasibility and practicality of removal and reconstruction of the outfalls should be evaluated during design to determine remedial technology application.

42. **Section 3.6.3, Upland Source Controls (Project Area Characterization), page 11:** The Work Plan indicates that sediment remedy design will evaluate potential impacts to the

HC&C system and infrastructure. EPA acknowledges the need for the evaluation, but notes EPA's and DEQ's long-standing position that source control measures, like the HC&C system and/or associated infrastructure, should not be used to limit the scope of the in-water sediment remedy. For example, stabilization of HC&C system extraction wells has previously been discussed, and an approach was identified by NW Natural for stabilizing installations, if needed, during sediment remedy construction (i.e., cross-well strapping).

Regarding the HC&C system, the Work Plan states, "The existing system is designed to prevent the discharge of contaminated groundwater from the Alluvial WBZ to the river in perpetuity (i.e., the sediment remedy design will assume this system is operational for the entire sediment remedy performance period)." EPA disagrees with this statement as the HC&C system has not been subject to full evaluation in the uplands FS. A pre-design assumption that the HC&C system will operate in perpetuity for the entire sediment performance period could undermine the planning and design process with DEQ by excluding evaluations of remedial alternatives that do not rely on the system.

Section 4 – Pre-Remedial Design Technical Evaluations

43. **Section 4.2.1, Performance Standards and Design Objectives (for Capping Demonstration Evaluation), page 14**: This section provides a bulleted list of cap design objectives, which includes "design a cap that can withstand erosive forces from currents, wind-induced waves, vessel-induced waves, and vessel propeller wash." Similarly, Section 4.2.2 lists erosive forces that include "hydrodynamic, wind-induced waves, vessel-induced waves, and vessel propeller wash." Edit the Work Plan text in both these cases by adding "(up to a 100-year flood)" in a parenthetical after "currents" and "hydrodynamic." The bullet text should be edited to read, "Design a cap that can withstand erosive forces from currents (up to a 100-year flood), wind-induced waves, vessel-induced waves, and vessel propeller wash and will be stable on the existing slopes."

44. **Section 4.2.1, Performance Standards and Design Objectives (for Capping Demonstration Evaluation), page 14, 3rd bullet:** The bullet text should be edited to read, "Design and place a cap in a way that will not exceed the bearing capacity and shear strength of the underlying sediments, and maintain slope stability of the sediments and riverbanks."

45. **Section 4.2.2, Design Elements Necessary for Capping Demonstration, page 14, 1st paragraph:** The text states that "Figure 5 is a flow chart developed by EPA (Palermo et al. 1998b) that illustrates the five steps involved in the design evaluation of various cap components." It should be noted that a component of the cap may serve the function of multiple design components and that current design practice would not include separate components for each design consideration.

46. **Section 4.2.2, Design Elements Necessary for Capping Demonstration, page 14, 1st paragraph:** The last sentence should be modified to read, "These guidance documents categorize the cap design into the following design components:"

47. **Section 4.2.2, Design Elements Necessary for Capping Demonstration, page 14, 1st bullet:** The bullet text should be modified to read, "Direct contact—determine the required cap necessary to reduce potential exposure due to direct contact and reduce the ability of burrowing organisms to move *contaminated sediment particles* to the surface."

48. **Section 4.2.2, Design Elements Necessary for Capping Demonstration, page 14, 2nd bullet:** "Stabilization" should be changed to "Filtering".

49. **Section 4.2.2, Design Elements Necessary for Capping Demonstration, page 14, "Erosion" bullet**: The bullet text should be modified to read, "determine the grain size and thickness required to prevent erosion of the cap at the design slopes."

50. **Section 4.2.2, Design Elements Necessary for Capping Demonstration, page 14, "Chemical Isolation Component" bullet:** The bullet text should be updated to read, "Contaminant transport—determine the cap characteristics necessary to prevent the breakthrough into, and recontamination of the biologically active zone above ROD Table 17 values or acceptable site-specific levels of chemical contaminants..."

51. **Section 4.2.2, Design Elements Necessary for Capping Demonstration, page 15, 2nd paragraph:** The Work Plan text states, "As a result, the appropriateness and effectiveness of capping for any given area will need to be further defined in design based on site-specific data…" If capping is to be evaluated in areas that the ROD contemplates for dredging, then the Work plan needs to provide more clarification as to how this evaluation will be done, if known at this stage, and should discuss potential changes to the ROD's technology assignments in more detail. For example, in areas of PTW-NAPL there is the potential for dredging/excavation to mobilize NAPL through physical agitation of sediment (or soil) and/or by truncating NAPL saturated layers within and along the margins of dredge/excavation areas. Potential mobilization of NAPL during dredging should be a consideration during cap modeling and design (e.g., placement of thicker chemical isolation or reactive residual layer[s]).

52. **Section 4.2.2, Design Elements Necessary for Capping Demonstration, page 15, 2nd paragraph:** The Work Plan implies that the ROD technology application decision tree is "flexible." EPA does not agree with this language. The text should be revised to indicate that the ROD allows for modifications that may be necessary during design to account for site-specific conditions.

53. **Section 4.2.3.1, Physical Isolation (Element 1 - Contaminant Confinement of Capping Demonstration Evaluation), Page 16, 1st paragraph:** The Work Plan text states, "Two potential contaminant pathways exist via direct physical contact with contaminated sediment—bioaccumulation and bioturbation." While this statement refers to direct contact with sediments, exposure pathways for organisms via surface water exposure exist as well. Because this is the only discussion of exposure pathways in the Work Plan, all existing pathways should be listed.

54. **Section 4.2.3.1, Physical Isolation (Element 1 - Contaminant Confinement of Capping Demonstration Evaluation), Page 17, bullet text:** The bullet states, "Demonstrate the cap will be thick enough or coarse-grained enough to prevent direct contact by benthic organisms with the underlying contaminated sediments." Being coarse-grained is not a requirement for physical isolation and it may not be good for meeting filtering criteria or for limiting inter-mixing between sediment and capping material during placement. The Work Plan must provide an explanation for how being coarse-grained allows the cap to provide physical isolation from benthic organisms, or delete this phrase from the text. It should be noted that

these layers may be combined, but are distinct from the additional thickness required for armoring.

55. **Section 4.2.3.1.2, Data Requirements and Data Gaps (Element 1 - Contaminant Confinement of Capping Demonstration Evaluation), page 17, 1st paragraph:** The Work Plan states, "Per data collected from surveys of benthic invertebrates in the Lower Willamette River in October 2002 and July 2005, EPA (2015) estimated that the burrowing depths of these organisms is approximately 4 to 10 centimeters (1.5 to 4 inches)." However, the ROD (Section 7.4.1, p. 30) states, "The biologically active zone of the Site that supports benthic communities is in the "shallow" sediment (less than 38 cm deep) and is generally 10 to 20 centimeters (cm) deep, based on sediment profiling imaging data gathered during the RI." The applicable biologically active zone to be used in the cap modeling evaluations is 30 cm. The monitoring program established for cap performance in sediment and groundwater flux through the cap will be based on a point of compliance set at 30 cm below the top of the bioturbation layer.

56. **Section 4.2.3.2, Chemical Isolation (Element 1 - Contaminant Confinement of Capping Demonstration Evaluation), page 18, last paragraph:** The text states, "As presented in the Draft EE/CA (Anchor QEA 2012a) and the groundwater source control presentation to EPA by NW Natural on September 21, 2015 (Anchor QEA 2015), the upland Alluvial WBZ HC&C system reverses the offshore alluvium groundwater gradient (i.e., from toward the river to toward the upland) over a substantial portion of the Interim Project Area and, therefore, minimizes long-term contaminant advection to the river over most of the site, leaving only the diffusion process as a possible means of contaminant transport to the river." As indicated above (see above comment to "Section 3.1, Presence of Principal Threat Waste, page 7, PTW-NRC bullet"), the HC&C system is currently considered an interim removal action that is subject to performance and effectiveness evaluations in the uplands FS. Consequently, the system has yet to be evaluated for long-term effectiveness. Consistent with the ROD and statements in the Work Plan, the time period for the HC&C system (and Fill WBZ containment measure) effectiveness evaluation should be at least 100-years (i.e., the cap design timeframe for preventing breakthrough of COCs). Until uplands FS evaluations are complete, statements made in the Work Plan indicating the HC&C system is an effective element of the final sediment remedy (and uplands remedy) are premature.

57. **Section 4.2.3.2, Chemical Isolation (Element 1 - Contaminant Confinement of Capping Demonstration Evaluation), page 18, last paragraph:** The text states, "The Fill WBZ groundwater containment technology will be in place before the sediment remedy is implemented." The text should incorporate a discussion on how long the Fill Water Bearing Zone (WBZ) system will be operated (i.e., at least 100-years for an effectiveness evaluation of a containment measure) and if the design should consider conditions prior to the groundwater containment.

58. **Section 4.2.3.2, Chemical Isolation (Element 1 - Contaminant Confinement of Capping Demonstration Evaluation), page 19, 1st bullet:** This section presents proposed performance standards for chemical isolation in areas with and without long-term advection, which includes demonstrating "that the long-term predicted average sediment concentrations in the top 10 cm (EPA's 2015 reported maximum burrowing depth of benthic organisms) of

the material overlying the cap isolation layer (i.e., filter material in nearshore caps and sand material in offshore caps) will be less than ROD-identified RALs (e.g., related to sediment-dwelling organism exposures)". However, the upper 12-inch (30-cm) depth interval is an appropriate depth interval for evaluation based on the physical and biological characteristics of the Portland Harbor Superfund Site and is consistent with the surface sediment interval sampled during the Portland Harbor Remedial Investigation and documented in the ROD (see ROD p. 21). A depth of 30 cm, rather than 10 cm should be used for evaluating long-term predicted average sediment concentrations. Additionally, the long-term predicted average sediment concentrations should be less than the cleanup levels identified in Table 17 of the ROD within the top 30 cm.

59. **Section 4.2.3.2, Chemical Isolation (Element 1 - Contaminant Confinement of Capping Demonstration Evaluation), page 19, 2nd bullet:** This section includes a performance standard to "Demonstrate that the long-term predicted surface water concentrations above the cap isolation layer and associated with groundwater flux through the cap are *less than applicable ecological chronic surface water criteria* (e.g., related to surface water-dwelling organism exposures)". "The conservative approach analysis compares pre-dilution *porewater concentrations at a depth of 1 cm below the surface* of the top of the modeled cap to the water quality criteria" (emphasis added). EPA disagrees with this performance standard. Rather, the long-term predicted average porewater concentrations should be less than the cleanup levels based on RAOs 4 and 8 specified in ROD Table 17 should be achieved throughout the upper 30 cm of the sediment bed or cap material for a period of at least 100 years.

60. **Section 4.2.3.2.1, Method of Analysis (Chemical Isolation), page 19, 1st paragraph:** The text states, "The time-variable Reible model will be used; the theory and solution techniques associated with the time-variable model are documented in Go et al. (2009)." This model has limitations in the surface processes. It does not specifically address water column inputs, sedimentation, resuspension and surface flux. The model applies an uncalibrated mass transfer coefficient to address surface conditions. It would be best applied to predict concentrations at the bottom of the biologically active zone. Other models should be considered, such as the U.S. Army Corps of Engineers (USACE) Cap/Recovery model, to confirm predictions within the biologically active zone.

61. **Section 4.2.3.2.1, Method of Analysis (Chemical Isolation), page 19, 2nd paragraph:** The text states, "The model predicts chemical concentrations at the locations identified in the performance standards summarized above. Consistent with evaluations at other sites…" While this model is not suitable for predicting concentrations at originally prescribed performance standard locations, it is appropriate for predicting concentrations at the EPA point of compliance of 30 cm below the cap surface.

62. **Section 4.2.3.2.1, Method of Analysis (Chemical Isolation), page 20, 1st paragraph:** The text states, "If the model-predicted concentrations exceed the water and sediment quality-based performance standards noted above, additional modeling will be performed to determine if the addition of treatment layers (such as activated carbon or organoclay) into the cap material will attain the performance standards." Additional thickness or alternative capping media should also be considered. The sensitivity to surface processes should also be

evaluated along with other inputs unless the compliance point is set at 30 cm below the surface.

63. **Section 4.2.3.2.1, Method of Analysis (Chemical Isolation), Page 20:** The Work Plan states, "…the model will be run through a time period appropriate for determination of the long-term effectiveness of the cap (e.g., 100 years), relevant to the expected design life of the cap." Consistent with the ROD, caps should be designed to prevent breakthrough of COCs for at least 100 years so the cap models should be run for at least 100 years. The Work Plan should be modified to state this time period explicitly and not as an example.

64. **Section 4.2.3.2.2, Data Requirements and Data Gaps (Chemical Isolation), page 20, 1st paragraph:** Regarding cap modeling, the Work Plan states, "In many cases the values are identical to or very close to those used in the EPA FS. In other cases, small differences exist due to the use of different literature sources or updated site-specific information." Table 6 presents the input parameters along with a "Data Sources/Notes" column. Though it is useful to see which parameters are consistent with the ROD, the EPA requests that rationale be provided for the parameters that are not consistent with the ROD. In other words, why was it determined that a given ROD value was not representative of the Project Area? The availability of site-specific information is one rationale, but rationale should also be provided when different literature sources are used. This information will better enable us to determine whether we have substantial concerns with any of the parameters that are inconsistent with the ROD. The modeling evaluations should also present all inputs used (including default model values) and provide the model name and version used in the evaluation. The use of multiple models should also be considered since they have different formulations and assumptions: resuspension, sedimentation, burial, degradation, variable material properties, linear versus non-linear adsorption, particle mixing, diffusion, water column interactions, surface flux modeling, Depth of Contamination (DOC)-facilitated transport, etc. Relative to the pending groundwater seepage flux information, it should be recognized in the Work Plan that there will be a large degree of extrapolation and uncertainty associated with the seepage meter data that in-turn will present a range of flux estimates throughout the site. EPA expects the higher end of that range be used for uncertainty and conservative estimation input into any modeling that would refine the PTW-NRC footprint.

65. **Section 4.2.3.2.2, Data Requirements and Data Gaps (Chemical Isolation), page 20, last paragraph:** The Work Plan states, "NW Natural agrees that additional collected empirical groundwater flow data collection will provide the primary line of evidence supporting refinement of the cap modeling." It should be noted that empirical data collection for groundwater flow should be focused on edge-effects of the HC&C system capture zone.

66. **Section 4.2.3.2.2, Data Requirements and Data Gaps (Chemical Isolation), page 21, last paragraph:** The Work Plan text states, "Cap model input values for water quality will use existing sediment and dissolved phase data supplemented by groundwater sample concentration data from nearby wells, if necessary." The dissolved phase data used as input should be from site-specific porewater measurements and porewater measurements should be collected if this is identified as a data gap. Using data from nearby wells is not acceptable for the design of the cap.

67. **Section 4.2.5, Element 3 – Erosion Resistance (of Capping Demonstration Evaluation):** This section should include a discussion of potential anthropogenic impacts to the surface of the constructed cap. As stated in the ROD (page 114), “Minor structures, such as outfalls, will be moved to accommodate dredging and capping when necessary.” Section 4.2.5 should include a discussion of outfalls within the project area and that outfalls will be moved prior to cap construction. The erosion resistance assessment should also include an evaluation of erosive forces along the edge of the cap in addition to forces along the surface of the cap to prevent scour resulting from a grade change or substrate change between the sediment bed and the surface of the newly constructed cap under both typical flow conditions and anticipated flood events.

68. **Section 4.2.5, Element 3 – Erosion Resistance (of Capping Demonstration Evaluation):** The armor layer design presented in this section does not discuss the effects on habitat. The ROD (page 113) states, "Additionally, all caps will be constructed with sufficient armor material to remain in place when subject to erosive forces resulting from wind and vessel generated waves, current, or propeller wash while minimizing adverse effects on the in-river and riparian habitat, including the loss of shallow water habitat." While not necessary at this stage, the role of the armor layer should evaluate the effects on habitat, if any, as stipulated by the ROD during final remedy design.

69. **Section 4.2.5.1.3, Vessel-generated Waves (Element 3 – Erosion Resistance of Capping Demonstration Evaluation), page 24, 1st paragraph:** The Work Plan states that the Lower Willamette Group (LWG) draft FS “concluded that a passenger ferry should be used as the design vessel for the Final Project Area.” Work Plan text should be added to this section clarifying that all recreational and commercial vessels will be assessed during the current evaluation regardless of the LWG FS conclusion. The evaluation just needs verify what the worst case would be in all areas of the site. The ferry may not be critical in shallow waters where recreational vessels may have greater impacts.

70. **Section 4.2.5.1.3, Vessel-generated Waves (Element 3 – Erosion Resistance of Capping Demonstration Evaluation), page 25, last paragraph:** The Work Plan text states, “The predicted wave heights for the recreational and commercial vessels will then be used to predict the minimum stable armor material…” Because armor layer size is being determined using wave heights calculated for both recreational and commercial vessels, the more conservative armor size of the two should be selected. The Work Plan should include this clarification. This evaluation should also include bottom shear stresses in addition to wave heights. EPA suggests that a range of models be considered, and the rationale for selecting the appropriate model be documented in the appropriate technical memorandum.

71. **Section 4.2.5.1.4, Propeller Wash (Element 3 – Erosion Resistance of Capping Demonstration Evaluation), page 25:** This section presents Equation 4-3 for determining propeller wash velocity. However, the Palermo et al. (1998b) reference document indicates that this equation is for thrusters and it provides a different equation for propeller wash. The text should provide a justification for using the thruster equation from Palermo et al. (1998b).

72. **Section 4.2.5.2, Data Requirements and Data Gaps (Element 3 – Erosion Resistance of Capping Demonstration Evaluation), page 27:** This section describes data requirements and data gaps for the erosion resistance element of the capping demonstration evaluation. As

part of this section, a new bathymetry survey is proposed in the Final Project Area since the last detailed survey was performed in 2011. Clarification should be provided regarding the expected use of this dataset. Further, Sections 4.2.6.2 and 4.2.7.2 describe data requirements and data gaps for the "presence and effect of debris" element and "slope stability" element of the capping demonstration evaluation. Both sections appear to rely upon the 2011 bathymetry data. If new bathymetry data are collected, clarification should be provided on whether the new data will be used for the debris removal and slope stability evaluations.

73. **Section 4.2.5.2, Data Requirements and Data Gaps (Element 3 – Erosion Resistance of Capping Demonstration Evaluation), Page 27, last paragraph:** The Work Plan text states that the topography "has not changed substantially" since the 2006 and 2011 surveys. The Work Plan should reference any reports that support this statement.

74. **Section 4.2.6, Element 4—Presence and Effect of Debris, page 28, 1st paragraph:** The text states, "This assessment would determine whether exposed debris can be capped in place such that the cap is effective per the guidance design considerations (e.g., Figure 5) or if it must be removed at the mudline prior to capping." The assessment should consider that debris extending up through the cap can cause localized scour and the text should be updated accordingly.

75. **Section 4.2.6.1, Methods of Analysis (Element 4 – Presence and Effects of Debris of Capping Demonstration Evaluation), page 28, 1st paragraph:** The Work Plan text states, "low-profile debris laying on the sediment surface that can be completely covered by the full-thickness of cap and effectively contained within the cap is not expected to impact the performance of the physical or chemical isolation." This assertion should be supported with citations or other relevant information.

76. **Section 4.2.6.1, Method of Analysis (Element 4 – Presence and Effects of Debris of Capping Demonstration Evaluation), page 28, 1st paragraph:** The text states, "For instance, removal of abandoned piling may reduce the stability of existing slopes where a cap is to be placed—a better alternative may be to cut the piling at or just below the mudline." It should be noted that decaying pilings can provide future preferential routes for advection and should be avoided as much as possible.

77. **Section 4.2.7, Element 5 – Slope Stability (of Capping Demonstration Evaluation), page 29, 1st paragraph:** The Work Plan text states, "Stable cap construction has been successfully completed at numerous sites, including sites within the Portland Harbor (e.g., Gasco Tar Body Early Action, McCormick and Baxter, and the Port of Portland's Terminal 4)." Any lessons learned from these studies should be incorporated into the Sediment Remedy Basis of Design Technical Evaluation Memorandum that deals with capping.

78. **Section 4.2.7, Element 5 – Slope Stability (of Capping Demonstration Evaluation), pages 29-30:** This section addresses slope stability of capped areas. However, dredging of contaminated sediment, especially at the toe of channel slopes and river banks, may cause potentially unstable conditions. Therefore, consideration should also be given to stabilizing post-dredge slopes in dredge prism design.

79. **4.2.7, Element 5 – Slope Stability (of Capping Demonstration Evaluation), page 29, 1st paragraph:** In addition to rotational global failure modes through soft silty/clayey sediments in capped areas, consideration should be given to shallow planar sliding modes through the cap material interfaces and underlying sediment, especially in sloped cap areas. This section should also include a discussion of seismic considerations.

80. **4.2.7.1, Method of Analysis (Element 5 – Slope Stability), page 30:** The reference USACE (2003) Slope Stability Engineering Manual contains recommendations for both short-term and long-term loading conditions. The Element 5 technical memorandum should clarify which factor of safety (FOS) will be applicable to stability evaluations for the capped areas. EPA recommends using a minimum FOS of 1.5 due to variability in material properties, construction practices and localized site conditions instead of the 1.3 minimum FOS provided in the referenced USACE Manual.

81. **Section 4.2.8, Element 6—Bearing Capacity, page 33:** This section should include a discussion of seismic considerations and liquefaction.

82. **Section 4.2.8.1, Method of Analysis (Element 6 – Bearing Capacity), pages 31-33:** A minimum required FOS of 1.5 is recommended for bearing capacity evaluations of capped areas. Please explain if a FOS of 1.5 is considered appropriate to avoid excessive settlements and potential 'mud-waving' effects in soft fine-grained sediments that could affect cap placement.

83. **4.2.8.1, Method of Analysis (Element 6 – Bearing Capacity), pages 33, last sentence:** This section states, "Assessment using these three lines of evidence will be used to determine the maximum cap thickness necessary to meet the bearing capacity performance standard." Please confirm if this sentence should state "maximum cap thickness allowable" instead of "maximum cap thickness necessary."

84. **Section 4.2.8.1, Methods of Analysis (Element 6 - Bearing Capacity), page 33, 1st paragraph:** The Work Plan text states, "Subaquatic cap placement has been successfully demonstrated at multiple sites when designed using a bearing capacity FOS of 1.5." Provide references for these successfully demonstrated use of bearing capacity FOS of 1.5.

85. **Section 4.2.8.1, Methods of Analysis (Element 6 - Bearing Capacity):** This section should include an evaluation of consolidation. As indicated in Table 6, the cap modeling includes consolidation so an estimate of site-specific consolidation should be used in the cap modeling. While consolidation was not evaluated during the FS capping modeling evaluations, it should be considered during design, as it can affect both the effective thickness of the cap and cause contaminated porewater to move upward.

86. **4.2.8.2, Data Requirements and Data Gaps (Element 6 – Bearing Capacity), pages 33-34:** A survey of shoreline conditions should be considered to identify soil/sediment conditions, significant erosion features, previous landslides, tilted vegetation, steepness of upland slopes, and other visual indicators of potential slope instability that may be useful in conducting stability evaluations.

87. **Section 4.2.9, Element 7—Treatment Requirements, page 34:** This section needs to discuss characterization of the capacity and effectiveness of amendments.

88. **Section 4.2.9, Element 7—Treatment Requirements, page 34, 1st paragraph:** The text states, "Rather, the need for treatment layers is determined as part of the contaminant containment assessment completed using existing Final Project Area conditions and modeling." Thickness limitations based on stability, bearing capacity, or water depth would also dictate the need for treatment, if the allowable thickness is not adequate for contaminant containment. The text should be updated accordingly.

89. **Section 4.2.9, Element 7 – Treatment Requirements (of Capping Demonstration Evaluation), page 34, 3rd paragraph:** The Work Plan text states, "Appendix I of the Draft EE/CA (Anchor QEA 2012a) includes this type of demonstration for the addition of an active layer of organoclay and provides a template for the cap treatment requirement evaluation." The Work Plan should be modified to directly state that the EE/CA demonstration may be used as a template for the cap treatment requirement evaluation but any deviations necessary, based on site-specific information, can be made during cap design.

90. **Section 4.2.12, Operational Considerations (for Capping Demonstration Evaluation), page 35:** This section states that operational considerations will include planned monitoring and maintenance of the cap. This section should also discuss the type of monitoring to be expected in each medium (e.g. sediment, pore water, and surface water). The document should also note that the cap will include both physical and chemical monitoring. Furthermore, other cap monitoring considerations such as sampling access points through armor stone, confirmation cores to determine as-built cap thickness and active amendment composition, etc. should also be noted as being considered during design.

91. **Section 4.3, Performance Standards and Design Objectives (for Dredging Evaluation), page 36:** The design objectives for areas and volumes where dredging is determined for the design should be updated to acknowledge that dredging will also have to take place to make room for caps.

92. **Section 4.3.1, Performance Standards and Design Objectives (for Dredging Evaluation), page 36, 1st bullet:** The bullet text states, "Remove, to the extent practicable, contaminated sediment concentrations exceeding the ROD-identified RALs (Table 5) and sediments containing PTW-NAPL/NRC that are not shown to be suitable for capping using pre-design data. Removal throughout the dredge prism will be deemed complete when comparison of the pre- and post-construction bathymetry surveys identify the design dredge elevations or depths are achieved." The text should discuss how confirmation sampling will be done to verify that the cleanup levels identified in Table 17 of the ROD have been met after dredging. The discussion should state that for dredging based remedies, the goal is to achieve the cleanup levels specified for sediments and riverbank soils in ROD Table 17. Furthermore, this section should specifically state what "not shown to be suitable" means in the statement "sediments containing PTW-NAPL/NRC that are not shown to be suitable for capping" (first bullet in section).

93. **Section 4.3.2, Dredge Prism Evaluation (for Dredging Evaluation), page 37, 1st paragraph:** The last sentence of this paragraph should read "Also, consistent with the ROD

decision tree, dredging will not be performed under structures that are left in place, and as noted in Section 4.7, this will include necessary offsets to protect structural integrity."

94. **Section 4.3.2, Dredge Prism Evaluation (for Dredging Evaluation), page 37-38:** This section of the Work Plan should include a discussion on the placement of a residual layer in areas where RALs are achieved through dredging and placement of a cap if RALs are not achieved. Refer to Page 105 of the ROD for further guidance.

95. **Section 4.3.3, Additional Considerations (for Dredging Evaluation), page 38:** An evaluation of overhead and underwater utilities should be included as an additional consideration for dredge design evaluations.

96. **Section 4.3.4, Methods of Analysis (for Dredging Evaluation), page 39, last paragraph:** The Work Plan states, "The need for sand cover will be determined based on the mass balance results." Note that the ROD stipulates the placement of a 12-inch residual sand layer over dredged areas that do not have caps to cover the exposed surface and isolate any dredge residuals. The Work Plan should be revised accordingly.

97. **Section 4.3.5, Basis of Design Technical Evaluation Memorandum Elements (for Dredging Evaluation), page 40, 5th bullet:** The text of the bullet states, "Identification of necessary dredging offsets from structures to avoid negative impacts" Location controls such as Real Time Kinematic (RTK) should be incorporated into the operations design for both lateral and vertical positioning. The text should be updated accordingly.

98. **Section 4.3.5, Basis of Design Technical Evaluation Memorandum Elements (for Dredging Evaluation), page 40, 9th bullet:** The text of the bullet states, "Construction quality control/quality assurance measures to confirm the dredge work." Residuals monitoring, both generated and undisturbed, should be conducted during construction.

99. **Section 4.3.5, Basis of Design Technical Evaluation Memorandum Elements (for Dredging Evaluation), page 40, 10th bullet:** The text of the bullet states, "BMPs to be followed during dredging" Resuspension controls should be implemented as part of dredging best management practices with consideration of potentially sensitive areas within the area negatively impacted by dredging operations that may require greater protection.

100. **Section 4.4 Riverbank Remedy Evaluation, Page 41, 2nd paragraph and Section 4.4.5, Page 43, 1st bullet:** Text in these sections exclude mention of PTW (toxicity based and PTW-NRC) in determining the need for remediation. This is inconsistent with the ROD, which requires remediation of the river bank if PTW, PTW-NAPL/NRC is present.

101. **Section 4.4, Riverbank Remedy Evaluation, page 41, 3rd bullet:** The text should be edited to read, "Remediation or stabilization may be needed where riverbank erosion evaluations show the potential for sediment recontamination based on soil erosion or slope instability."

102. **Section 4.4.4 Presence of PTW-NAPL/NRC and RAL and PRG Exceedances Evaluations (Riverbank Remedy Evaluation), Page 43, 1st complete paragraph:** This section indicates that the cores and boring locations shown in Figure 2 will be evaluated for evidence of PTW-NAPL continuity between the uplands and the riverbank. Figure 2 is incomplete and should be revised to show all current drilling locations along the shoreline.

For clarification, boring logs should be reviewed for potential PTW-NAPL continuity to the maximum depth of dredging near the shoreline. In addition, the proposal to screen the limited number of river bank soil/sediment samples, shown in Figure 8 against the RALs is not sufficient to identify areas of the riverbank requiring remediation. Data for all riverbank soil/sediment samples should be included in the screening, including the analytical results for surface and subsurface soil samples collected above the ordinary high-water level at or near the uplands side of the top-of-bank. The results should be compared to the cleanup levels in Table 17 of the ROD to identify locations of contaminated river bank. Per Section 14.2.5 of the ROD, the PTW thresholds and RALs in Table 21 of the ROD should be used to identify contaminated river bank areas that require remediation to protect the Selected Remedy. The ROD states that the entire river bank from the top of the bank to the river should be addressed and that contaminated river bank soil exceeding the PTW thresholds and erodible soil that exceeds RALs in Table 21 should be remediated under the Selected Remedy (refer to ROD Section 14.2.5 and the decision tree in Figure 28). Therefore, data for all river bank soil and sediment samples should be compared to the PTW thresholds and RALs for determining areas of the river bank required remediation.

103. **Section 4.5.2 Method of Analysis (Dredge Sediment Waste Handling and Transport Evaluation), page 44-45, 1st bullet:** Bench scale testing of dewatering amendments (included in the draft EE/CA) does not appear to be sufficient to support the evaluation of dewatering amendments or is not sufficiently explained. The bench scale testing described in the draft EE/CA was performed to evaluate the reduction in the leachability of contaminants, not to evaluate the dewatering capabilities of amendments. Additionally, the bench scale testing did not include sediment cores with concentrations of contaminants leaching above the TCLP criteria, before amendment addition, for disposal at a Subtitle D landfill.

    For example, the Final Work Plan[5] describes that the average trichloroethylene (TCE) concentration in subsurface sediment is 31,014 micrograms per kilogram (µg/kg) (average was calculated only for samples which TCE was detected), with a maximum concentration above 1,900,000 µg/kg. The bench scale testing does not appear to have evaluated the reduction of leaching potential for TCE because the initial concentration of TCE in the sediment core used for bench testing was not described in the report and the leachate sample results were non-detect in leachate before and after amendment addition. Bench scale testing for dewatering may need to be conducted to select a dewatering amendment. Additionally, bench scale testing to select amendments to treat sediments should include all chemicals which are present in the Project Area and will be used to profile waste for disposal to comply with ARARs and meet disposal facility acceptance requirements and applicable Federal, State, and local regulations and requirements offsite.

104. **Section 4.7.1. Performance Standards and Design Objectives (Functional Structures Determination), page 51, 1st bullet:** The performance standards for the functional structures determination should reflect the terminology presented in ROD Figure 28, Technology Application Decision Tree. The bullet should be revised to read, "Determine which structures within the Final Project Area are functional and/or permanent."

[5] Final Work Plan GASCO Sediments Cleanup Action. Prepared by Anchor QEA, LLC or NW Natural. January 13, 2010.

105. **Section 4.7.1. Performance Standards and Design Objectives (Functional Structures Determination), page 51, 2nd bullet:** The design objective to be used in the remedial design process should reflect the decision process presented in ROD Figure 28, Technology Application Decision Tree. The bullet should be revised to read, "Demonstrate that the technology assignment selected to address contamination near specific structures ("Cap" or "Dredge and Cap") appropriately remediates contaminated sediments and meets the RAOs in accordance with the ROD."

106. **Section 4.7.2. Method of Analysis (Functional Structures Determination), page 51-52, 1st paragraph:** According to the decision process presented in ROD Figure 28, Technology Application Decision Tree, there are two conditions that must be met for a functionality determination: 1) "structure is currently operating or is used to stabilize the bank" and 2) "service life is greater than 50 years." Essentially, the functionality of the structure should be determined by both the operation/use of the structure and the condition (service life/state) of the structure.

    The permanence of the structure, defined as whether the structure is "floating or movable" should not be included within the definition of a functional structure, but as a separate evaluation to determine the appropriate technology assignment associated with a functional structure. For example, if a structure is not functional, the permanence (e.g. floating or moveable) is not relevant because the structure will be removed regardless.

107. **Section 4.8.2, Operational Controls, page 53, 1st bullet:** The text of the bullet states, "Requiring a debris sweep prior to dredging in known debris areas (debris caught in dredging equipment can cause additional resuspension and release of contaminated sediments)." It should be noted that separate debris removal activities may disturb the sediment structure leading to greater erosion and resuspension during dredging. Debris removal should be integrated with dredging activities using the same equipment for both to the extent practicable.

108. **Section 4.8.2, Operational Controls, page 53, 5th bullet:** The text of the bullet states, "Limiting operations during relatively high-water velocity conditions (turbulence in the vicinity of the dredge bucket during high flow conditions can cause additional resuspension and release of contaminated sediments)." Conducting operations during high-water provides greater dilution but greater erosion of residuals. Residuals should be covered immediately after dredging to prevent erosion of residuals. It should be noted that residuals losses are greater than resuspension losses. The text should be updated to reflect this.

109. **Section 4.8.2, Operational Controls, page 53, 8th bullet:** The text of the bullet states, "Preventing the overfilling of conventional clamshell (i.e., "open") buckets." The text should clarify that preventing overfilling also applies to closed buckets. Overfilling expels sediments out of the vents on a closed bucket and entrains water in the residuals, reducing their cohesion and making them erodible. The expelled sediment may also be resuspended in the suction wake created as the bucket is lifted from the sediment surface.

110. **Section 4.8.2, Operational Controls, page 53, 9th bullet:** The text states, "Requiring the slow release of excess bucket water at the water surface." Based on lessons learned from the

NTCRA conducted at Gasco in 2005[6], barge water treatment is likely to be a requirement and that should be recognized in the Work Plan.

111. **Section 4.8.3, Barrier Controls, page 53, 1st bullet:** It should be noted that silt curtains have limited value as engineered barrier controls.

112. **Section 4.8.3, Barrier Controls, page 54, 1st bullet:** The text states that empirical information will be gathered and researched for numerous implementability issues, including the "Release of highly concentrated contaminants sequestered within the containment area following removal of the containment barrier." Treatment of such releases should also be considered and should include this as part of the engineered barrier controls research described in this section. Note that contaminants are likely to be sequestered only if rigid containment is used. Significant water exchange occurs with silt curtains in areas with flowing water, tidal exchange or wind-induced circulation.

113. **Section 4.9.3, Basis of Design Technical Evaluation Memorandum Elements (Habitat Modification Evaluation), page 59, bullet 2:** This bullet states "Potential effects of remedial design to waters of the United States and ESA-listed species and critical habitat." EPA assumes this is referring to effects of remedial activities such as dredging and material placement, not the remedial design. Clarification should be provided in the text as necessary.

114. **Section 4.9.3, Basis of Design Technical Evaluation Memorandum Elements (Habitat Modification Evaluation), page 59, bullet 3:** This bullet states, "Compensatory mitigation incorporated into the design to offset habitat modifications otherwise resulting from implementation of the remedial design, if applicable." Compensatory mitigation refers to actions to offset unavoidable impacts resulting from implementation and does not refer to design features that could be incorporated to avoid habitat modification. This bullet should be re-worded for clarity.

115. **Section 4.10.2, Method of Analysis (Flooding Impact Evaluation), page 61:** This section states that the method for the flood impact analysis will be consistent with the ROD. Section 4.10.2 further explains that:

> *"the total sediment remedy design net dredging and material placement balance will be determined. If the total fill volume of cap and other placed materials is comparable to or less than the total cut volume due to dredging and other removal activities, then the performance standard is met and flood flow impacts will not be further assessed."*

However, this general statement and approach does not follow sound engineering procedures developed and required for any development that occurs within a Federal Emergency Management Agency (FEMA) regulatory floodway. The procedure explained in Section 4.10.2 also contradicts the ROD. The ROD (page 64) states:

[6] GASCO Early Removal Action Construction Oversight Report, prepared by Parametrix for the U.S. Environmental Protection Agency Region 10, November 16, 2006

"A Hydrologic Engineering Center River Analysis System (HEC-RAS) model will be run on the Selected Remedy to ensure that flood rise management complies with regulatory requirements throughout the Site. This model will be run on both smaller and larger scales in order to assess the flood-rise impacts of the cleanup."

This method explained in the ROD complies with 44 CFR section 60.3 (d) (3) procedures and guidance document, *Procedures for "No-Rise" Certification For Proposed Developments in the Regulatory Floodway*, released by FEMA Region X.

Section 60.3 (d) (3) of the CFR states:

"Prohibit encroachments, including fill, new construction, substantial improvements, and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base flood discharge;"

The FEMA Region X guidance document[7] describes the procedure to follow for obtaining "no-rise" certification before any significant development occurs within a regulatory floodway.

In general, the river system is dynamic and its flow regime can change from subcritical to supercritical based on changing river characteristics. Supercritical flow is characterized by shallow, high velocity flow with steep channel bottom slope while subcritical flow is generally deep, low velocity flow with shallow channel bottom slope. The change in flow regime between subcritical and supercritical can result in an abrupt increase or decrease in water surface elevation and erosional velocity at any given location along a channel reach. Therefore, it is highly critical to use the USACE HEC-RAS model to simulate the river system and follow the detailed engineering procedures as outlined in the FEMA guidance document.

List of Tables

116. There are several tables that are recreated from the ROD tables (i.e. Tables 2 through 5). EPA would prefer that a reference be made to the ROD tables rather than re-create them to avoid transcription errors and maintain consistency with the ROD in the event of any subsequent errata.

117. **Table 1 ARARs for Remedial Action at the Gasco Sediments Site, last column:** Applicability/appropriateness have connotations suggesting that the determinations in the ROD for each of the ARARs are being reevaluated. Suggest renaming this column to "Rationale for Exclusion or Implementation" or something similar.

118. **Table 6 – Chemical Isolation Cap Modeling Input Parameters:** The following should be addressed regarding this table.

    a. Identify the source for the selected consolidation values in underlying sediment.

[7] Procedures for "No-Rise" Certification for Proposed Developments in the Regulatory Floodway, FEMA/US Department of homeland Security, Region X, October 2013

b. The compliance criteria should be updated to reflect the cleanup levels identified in Table 17 of the ROD.

c. As explained in the comment to "Section 4.2.3.1.2, Data Requirements and Data Gaps (Element 1 - Contaminant Confinement of Capping Demonstration Evaluation), page 17, 1st paragraph" above, the bioturbation depth identified in the ROD is 10 to 20 centimeters (cm). The cap evaluation should utilize this range of bioturbation depths for modeling purposes. The point of compliance for performance monitoring purposes will be set at 30 cm below the cap surface.

d. Table 6 incorrectly references EPA ROD 2016 for multiple input parameters. This should be corrected to the EPA FS.

e. Specify how active treatment layers will be assessed using the cap model. The table does not indicate the use of any treatment layers.

f. The table proposes a very limited subset of PAHs and VOCs for purposes of cap modeling without explaining selection criteria. Contamination of sediments and groundwater by inorganic contamination (metals) and cyanide is documented and an important consideration for cap design evaluations. Table 6 should be revised accordingly. The list of contaminants and basis for their selection should be fully documented in the design memorandum for EPA review and approval.

List of Figures

119. **Figure 6 – Different Theoretical Processes of Contaminant Transport Through a Cap:** This figure shows materials depositing on the cap. It should also show the potential for those newly deposited materials to be eroded. Additionally, the text or a footnote associated with the figure should note that both positive and negative seepage may be present (i.e., tidal pumping) depending on the specific location.

Appendix A: Habitat Equivalency Analysis:

120. Please provide the calculation spreadsheets that show the formulas used for the HEA calculations.

121. The HEA workbook template should be updated to reflect the assumption that 2021 (the expected year of remedial construction) will be used as the base year for the HEA calculations. In addition, as noted above, 100 years should be used to reflect that the project life is in perpetuity.